Prepared for

Settling Work Defendants

WORK AREA MONITORING PLAN

OMEGA SUPERFUND SITE
OPERABLE UNIT 2

Prepared by

Geosyntec consultants

engineers | scientists | innovators

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Project Number: WR2209

18 November 2016

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Omega Superfund Site
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LIST OF ACRONYMS, ABBREVIATIONS, AND COMMON TERMS

2010 RI	August 2010 OU2 Remedial Investigation
2011 ROD	OU2 Interim Action Record of Decision, dated September 20, 2011
2016 CD	Consent Decree lodged April 20, 2016 covering Operable Unit 2 at the Omega Chemical Corporation Superfund Site
CDWR	California Department of Water Resources
CE Area	Central extraction area (The location of the CE area is depicted in the 2016 CD, Appendix C as the area between the NE and Telegraph Road.)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMP	Compliance Monitoring Plan
COCs	Chemicals of Concern
COPCs	Chemicals of Potential Concern
CSRS-H	California Spatial Reference System Horizontal
DQOs	Data Quality Objectives
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FSP	Field Sampling Plan
Geosyntec	Geosyntec Consultants, Inc.
IDW	Investigation-Derived Waste
LE Area	Leading Edge Area of OU2 is the area in the 2016 CD, Appendix C that is south of the CE Area
LEI	Leading Edge Investigation
Main COCs	13 COCs identified in the ROD as “main COCs” and listed in Table 1. Includes eleven VOCs, 1,4-dioxane, and

	hexavalent chromium. The Main COCs are included in the COC list for the RD.
MCLs	Maximum Contaminant Levels (EPA and California)
Monitoring Report	Work Area Monitoring Report
N/A	Not applicable
NE Area	Northern extraction area (The location of the NE area is depicted in Appendix C of the 2016 CD as an area north of the CE)
NE/CE Area	Northern Extraction/Central Extraction Area. A portion of the area of the groundwater contamination identified by EPA as OU2 in its 2011 ROD. The NE/CE Area is bounded by the OU2 boundary as depicted in the 2016 CD, Appendix C and the area north of Telegraph Road. It includes the NE and CE areas as depicted in the ROD as well as the northern portion of the LE area as depicted in the ROD.
NLs	Notification Levels, California State Water Resources Control Board
Omega	Omega Chemical Corporation
Omega Property	The property formally owned by the Omega Chemical Corporation, encompassing approximately one acre, located at 12504 and 12512 East Whittier Blvd, Whittier, California. OU1 and OU3 are addressing soil, groundwater, and soil vapor source control at the Omega Property.
OPOG	Omega Chemical Corporation Superfund Site Potentially Responsible Party Organized Group (listed in CD, Appendix F)
ORFP	Oil Field Reclamation Project
OU	Operable Unit, a discrete action that comprises an incremental step in the remediation of a contaminated site.
OU2	Operable Unit 2, the contamination in groundwater generally downgradient of Omega Property, much of which has commingled with chemicals released at other

	locations into a regional plume containing multiple contaminants which, when considered in total, is more than four miles long and one mile wide. The OU2 boundary is depicted in the 2016 CD, Appendix C.
PDI	Pre-Design Investigation
PDIWP	Pre-Design Investigation Work Plan
PRPs	Potentially Responsible Parties
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design (Remedial Design means those activities to be undertaken by Settling Work Defendants to develop the final plans and specifications for the Remedial Action pursuant to the Remedial Design Work Plan.)
RDWA	Remedial Design Work Area. (The RDWA consists of the NE/CE Area and includes potential treated water end use locations that may be adjacent to or outside of OU2.)
RI	Remedial Investigation
RWQCB-LA	Regional Water Quality Control Board, Los Angeles Region
QA/QC	Quality assurance/quality control
Site	Omega Chemical Corporation Superfund Site, originally listed on the National Priorities List on January 19, 1999, which is located in Los Angeles County, California, and includes the contamination being addressed by multiple Operable Units.
SOP	Standard Operating Procedure
SOW	Statement of Work, Appendix B of the CD
STLC	Soluble threshold limit concentration
SVOCs	Semi-volatile organic compounds
SWDs	Settling Work Defendants, as identified in Appendix E to the 2016 CD. SWDs include the McKesson Corporation

	and OPOG (Omega Chemical Corporation Superfund Site Potentially Responsible Party Organized Group).
TCLP	Toxicity characteristic leaching protocol
TDS	Total dissolved solids
TTLC	Total threshold limit concentration
USGS	United States Geological Survey
VOCs	Volatile organic compounds
WAMP	Work Area Monitoring Plan
Work Area	The portions of OU2 that are the subject of Work under the 2016 CD and the SOW.
WRD	Water Replenishment District of Southern California

LIST OF ADDITIONAL ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichlorethene
1,1,1-TCA	1,1,1-Trichloroethane
1,2-DCA	1,2-Dichloroethane
1,2,3-TCP	1,2,3-Trichloropropane
cis-1,2-DCE	cis-1,2-Dichloroethene
Freon 11	Trichlorofluoromethane
Freon 113	1,1,2-Trichloro-1,2,2,- trifluoroethane
NDMA	N-Nitrosodimethylamine
PCE	Tetrachloroethene
TCE	Trichloroethene

1. INTRODUCTION

This Work Area Monitoring Plan (WAMP) was prepared by Geosyntec Consultants (Geosyntec) on behalf of the Settling Work Defendants (SWDs) for the Omega Chemical Corporation Superfund Site, Operable Unit 2 (OU2). This WAMP was prepared in accordance with Section 3.5 of the Statement of Work (SOW), Appendix B of the Consent Decree (2016 CD) for OU2 at the Omega Chemical Corporation Superfund Site (United States Environmental Protection Agency (EPA), 2016a).

The purpose of this WAMP is to provide an outline of the annual monitoring activities to be performed in the Work Area during the timeframe of the design of the Northern Extraction/Central Extraction (NE/CE) Area remedy and prior to implementation of the Compliance Monitoring Plan (CMP) upon start-up of the remedy. This WAMP specifies the type, locations, frequencies, methods, and duration of monitoring, as well as reporting requirements associated with the data collected.

This WAMP describes monitoring activities to be performed for the Work Area, consisting of the Remedial Design Work Area (RDWA) and the Leading Edge (LE) Area, within OU2 (Figure 1).

In an effort to provide context in support of the described monitoring activities, this WAMP contains information on the investigative history, underlying geologic features and distribution of chemicals of concern in groundwater. The latter half of the WAMP provides an overview of the monitoring program with relevant documentation provided in WAMP attachments.

2. BACKGROUND

2.1 Site Overview

OU2 of the Omega Chemical Superfund Site addresses contamination in groundwater generally downgradient of the Omega Property, much of which has commingled with chemicals released at other locations into a regional plume containing multiple contaminants which, when considered in total, is more than four miles long and one mile wide. The 2011 ROD addresses containment of OU2 groundwater contamination. The OU2 boundary, as defined in the 2011 ROD, is presented in Figure 2. The Work covered by the SOW includes groundwater containment in the NE/CE Area as well as additional investigation in the LE Area. Source control at the former Omega Chemical Corporation facility in Whittier, California has been addressed under Operable Unit 1 (OU1) and Operable Unit 3 (OU3). Since 2001, the Omega Chemical Corporation Superfund Site Potentially Responsible Party Organized Group (OPOG) has led the investigation and remediation of the former Omega Property under OU1 and OU3 with EPA oversight. In addition to a 1995 removal action, source area remediation has also included groundwater and soil vapor extraction systems which began operating in 2009. McKesson Corporation has worked with California Department of Toxic Substances Control (DTSC) and has undertaken source control actions at its source property located on Sorensen Avenue. On December 7, 2015, the DTSC approved McKesson Soil Remedial Action Closure Report and determined the soil remediation portion of the project was complete. Other source properties contributing to groundwater contamination that has commingled with groundwater contamination from the Omega Property and the McKesson property have been addressed, are currently being addressed, or will be addressed by the DTSC or the Regional Water Quality Control Board, Los Angeles Region (RWQCB-LA) through investigations and source control actions. These activities are important for the future cleanup of OU2 but are not part of the current SOW.

2.2 OU2 Regulatory History Summary

The EPA assessment of the extent of groundwater contamination at OU2 consisted of several rounds of investigation beginning in 2002 and included the use of temporary hydropunch locations and a permanent network of groundwater monitoring wells developed over several years. The following is a summary of environmental regulatory and enforcement action for OU2:

- 2010 – EPA completed and published the Remedial Investigation (RI) and Feasibility Study (FS) for OU2 groundwater which included groundwater assessment activities that helped characterize contaminated groundwater within OU2 (CH2M Hill, 2010).
- 2010 – EPA issued the Proposed Plan Fact Sheet.
- 2011 – EPA issued an Interim Action ROD for OU2 groundwater (EPA, 2011). The Interim Action consisted of groundwater extraction and treatment with drinking water being the preferred end use of treated groundwater. Injection was considered as a backup end use if EPA determined that, based on efforts to negotiate agreements with drinking water purveyors, a drinking water end use could not be implemented in a timely manner.
- April, 2016 – EPA signed a CD with SWDs requiring SWDs to implement the majority of the 2011 ROD for OU2, including design, construct, and operate an interim groundwater treatment system(s) and conduct additional investigations for OU2 groundwater. The 2016 CD is currently awaiting approval by the Federal District Court (EPA, 2016a).
- May 2016 – EPA issued an Explanation of Significant Differences (ESD) to update the 2011 ROD. The primary change to the 2011 ROD included removing the preference for a drinking water end use and expanding the end-use options to include additional end-use options:
    - Delivery to an existing reclaimed water system (for irrigation and/or industrial use);
    - Return to groundwater basin using shallow or deep reinjection wells;
    - Return to groundwater basin using an existing spreading basin; or
    - A combination of end uses.

2.3 Hydrogeology

There are at least three different interpretations relating to hydrostratigraphic units in the vicinity of OU2 as follows: the California Department of Water Resources (CDWR) Bulletin 104 (1961); the 2010 RI Report (2010); and the United States Geological Survey (USGS) (2014 and on-going). Bulletin 104 focuses on identifying aquifers within the Los Angeles Basin. The 2010 RI Report builds upon Bulletin 104 and focuses on stratigraphic units that consist of a combination of coarse- and fine-grained sequences within and in the vicinity of OU2. The USGS focus is on chronostratigraphic units in the Central Basin which includes age correlated units that are not necessarily tied to aquifer/aquitard sequences. All three of the interpretations incorporate some of the key geologic structural features in the vicinity of OU2, but have conflicts in overall interpretation. A generalized description of the hydrostratigraphy based on Bulletin 104 nomenclature as adopted from the 2010 RI Report is presented in this Section. A comparison of existing water quality data using the Bulletin 104 and the 2010 RI Report is presented in the data gaps analysis which is an appendix to the Pre-Design Investigation (PDI) Work Plan (Hargis + Associates, Inc. [H+A], In press).

OU2 is located in the Whittier area of the Central Basin, a sub-basin of the coastal plain of Los Angeles County (CH2MHill, 2010). The coastal plain is bounded on the west and south by the Pacific Ocean and by mountains on the north, east, and southeast. The coastal plain is underlain by an extensive groundwater basin in Los Angeles and Orange Counties.

2.3.1 Hydrostratigraphic Units

The following description of hydrostratigraphic units is preliminary and will be refined for the RDWA based on existing and newly acquired data collected during the PDI. The hydrostratigraphy for the LE Area will be refined based upon the existing and newly acquired data collected during the Leading Edge Investigation (LEI).

Water-bearing sediments identified in the Whittier area extend to an approximate depth of at least 1,000 feet below ground surface (CH2M Hill, 2010). The identified geologic units consist of recent alluvium, the upper Pleistocene Lakewood Formation, and the lower Pleistocene San Pedro Formation. The Pliocene and Miocene marine sediments below the San Pedro Formation generally contain saline water in the Whittier area, are considered nonwater-bearing where exposed in the Puente Hills, and are not addressed in this report. Figure 3 shows a generalized stratigraphic column of fresh water- bearing sediments in the coastal plain of Los Angeles.

The shallowest hydrostratigraphic units (recent alluvium) include the semiperched aquifer, the Gaspur aquifer, and the Bellflower aquiclude (Bellflower aquitard). The Gaspur aquifer is mainly sand and gravel with a small amount of interbedded clay. The Gaspur aquifer is only found within the recent alluvium. However, the CDWR considers the semiperched aquifer and the Bellflower aquiclude to be present in both the recent alluvium and the upper part of the Lakewood Formation. The saturated portion of the Gaspur aquifer is for the most part to the west of OU2, but does extend east into OU2 in the area roughly centered about Slauson Avenue. The Gaspur aquifer may be present in the vicinity of the NE Area, although may not be present along the southeastern portion of this area. The Gaspur aquifer may be present on the western most portion of the CE Area; however, the current water table appears to be beneath the bottom of the Gaspur aquifer in this area.

The Lakewood Formation consists of non-marine deposits including the Artesia and Gage aquifers although the Artesia aquifer may only be present to the south of the RDWA and therefore is not considered relevant to the RDWA. The Gage aquifer may be absent or unsaturated in areas of OU2 north of the CE Area, and is generally present and saturated within OU2 from near the CE Area to the south. The Gage aquifer does not appear to be an important source of drinking water in the Whittier area, based on elevated total dissolved solids (TDS) concentrations measured in groundwater samples collected at OU2.

The San Pedro Formation unconformably underlies the Lakewood Formation. The San Pedro Formation has been subdivided into five named aquifers separated by clay layers. A fine-grained layer is also typically present at the top of the sequence; although, in localized areas, the uppermost San Pedro Formation aquifer may be merged with the overlying aquifer, and one or more of the five aquifers may also be merged (CDWR, 1961). The five aquifers defined within the San Pedro Formation include, from top to bottom, the Hollydale, Jefferson, Lynwood, Silverado, and Sunnyside aquifers. The Hollydale aquifer has been identified by the CDWR (1961) throughout most of OU2 with the exception of the northern most portion and the southeastern tip. As such, the Hollydale aquifer is expected to be saturated and present in the NE and CE areas. The other aquifers within the San Pedro Formation are thought to be present over most or all of OU2; however, the PDI scope of investigation is generally limited to the Hollydale and Jefferson aquifers with some limited investigation in the Lynwood aquifer in the NE Area based on data gaps analysis (PDI Work Plan, H+A, In press).

2.3.2 Geologic Structures and Faults

The major geologic structures in the area include the northwest-trending La Habra syncline underlying the alluvial basin (in the general vicinity of Slauson Avenue) and the west-northwest trending Santa Fe Springs (also named Coyote) anticline in the general area between Los Nietos Road and Telegraph Road (Figure 4) (CH2M Hill, 2010).

There are no known faults within OU2. The Whittier and Norwalk faults are both west-northwest trending, with the Whittier fault being located to the northeast of OU2 in the Puente Hills and the Norwalk fault being located to the south of OU2 (approximately along Interstate 5).

2.3.3 Groundwater Levels

The depth to groundwater at and in the vicinity of the RDWA has fluctuated over time. Water level hydrographs have been prepared for wells monitored by the Los Angeles County Department of Public Works between 1947 and 2016 (Figure 5). The water levels were highest at the start of this monitoring period and declined relatively steadily until the late 1950's, at which point the water levels were at a historical low. Following this time, which is roughly about the time the Central Basin was adjudicated, water levels recovered to some degree. Between 1970 and 2016, the water levels have fluctuated seasonally on the order of 5 to 20 feet. During this same time frame, the overall water level fluctuation has been almost 60 feet, with the high water level for the period of monitoring occurring in the mid-1990s and the low water levels occurring in 1978 and over the past several years.

The direction of groundwater flow has been evaluated by EPA in the 2010 RI and subsequent groundwater monitoring reports. Overall, the general direction of groundwater flow has been south-southwesterly flow in the area north of the CE Area and to the south-southeast in the area south of the CE Area. There have been shifts in the direction of groundwater flow that appear to correlate with changes in groundwater elevations.

Vertical hydraulic gradients have been evaluated as part of the 2010 RI and subsequent groundwater monitoring reports based on water levels measured in cluster monitor wells (monitor wells with screened intervals completed at different depths at the same general location). At cluster wells, water levels measured in deeper screens are generally lower than water levels in shallower screens.

2.3.4 Hydraulic Properties

The results of hydraulic tests indicate substantial variation in horizontal hydraulic conductivity. The results of existing and proposed hydraulic tests to be conducted as part of the PDI will be used to refine the estimates of horizontal hydraulic conductivity in the vicinity of the NE and CE Areas.

Hydraulic testing was conducted by EPA, OPOG and McKesson in different portions of OU2. Hydraulic testing was also conducted at the Phibrotech, Oil Field Reclamation Project (OFRP) and Technibraze sites. Hydraulic testing consisted of either slug and/or extraction tests. The existing hydraulic test data for the 2010 RI and for Bulletin 104 stratigraphic units have been compiled as part of the data gaps assessment (PDI Work Plan [PDIWP], H+A, In press).

2.4 Groundwater Chemistry

Routine groundwater sampling has been conducted by various parties in and adjacent to the RDWA. Groundwater monitoring in OU2 has focused on constituents that have been detected at concentrations exceeding their screening levels (maximum contaminant limits [MCLs] and notification levels [NLs]) and have been grouped in five categories: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), emergent compounds, metals, and general chemistry.

There were multiple VOCs that exceeded screening levels. The sources of the VOCs appear to be related to multiple sites within and adjacent to OU2. The 2010 RI Report identified VOCs that exceeded screening levels and the 2011 ROD identified eleven VOCs that are part of the main chemicals of concern (Main COCs) for OU2.

There was only one SVOC that was reported above the screening level (bis(2-ethylhexyl)phthalate). It is suspected that the detections are due to sampling activities and are not representative of groundwater conditions in OU2 (CH2M Hill, 2010). However, since bis(2-ethylhexyl)phthalate was detected above its screening level, this analyte was considered a chemical of potential concern (COPC) for OU2 in the 2010 RI Report. The 2011 ROD included bis(2-ethylhexyl)phthalate in the lists of treatment standards for treated groundwater end use, but did not include it as a Main COC.

Emergent compounds (1,4-dioxane, 1,2,3-trichloropropane [1,2,3-TCP], N-nitrosodimethylamine [NDMA], perchlorate, and hexavalent chromium) were detected at concentrations exceeding their respective screening levels. Therefore, each of these emergent compounds was considered a COPC for OU2 in the 2010 RI Report. The compounds 1,4-dioxane, 1,2,3-TCP, perchlorate, hexavalent chromium and NDMA were suspected to be related to one or more operations within OU2. The 2011 ROD included 1,4-dioxane and hexavalent chromium in the list of Main COCs, but did not list the remaining emergent compounds.

Aluminum, antimony, arsenic, total chromium, manganese, mercury, nickel, selenium, thallium, and vanadium were detected at concentrations exceeding their respective screening levels, and were therefore considered COPCs for OU2 in the 2010 RI Report. Some of the detected metals could be naturally occurring but industrial sources located within OU2 may have also contributed to these metals exceedances given that various industrial sources used these compounds (including total chromium and arsenic). The 2011 ROD included hexavalent chromium as a Main COC, and included aluminum, manganese, total chromium and selenium in one or both lists of treatment standards for treated groundwater end use.

General chemistry parameters have also been assessed in OU2 and several general chemistry parameters have been detected in exceedance of screening levels (e.g. TDS, nitrate and sulfate). The majority of general chemistry detections represent background (or natural) conditions in groundwater. The ROD did not include any of the general chemistry constituents as Main COCs, but did include TDS, nitrate and sulfate in the lists of treatment standards for treated groundwater end use.

2.4.1 Constituents

The 2011 ROD identified 13 COCs for OU2, eleven of which are VOCs (PCE [tetrachloroethene], TCE [trichloroethene], trichlorofluoromethane [Freon 11], 1,1,2-trichloro-1,2,2,-trifluoroethane [Freon 113], 1,1-dichloroethene [1,1-DCE], cis-1,2-dichloroethene [cis-1,2-DCE], chloroform, carbon tetrachloride, 1,1-dichloroethane [1,1-DCA], 1,2-dichloroethane [1,2-DCA], and 1,1,1-trichloroethane [1,1,1-TCA]); one is an inorganic constituent (hexavalent chromium) and the remaining compound is 1,4-dioxane (Table 1). As indicated previously, these 13 COCs will be referred to as Main COCs in the Remedial Design (RD) documents and are included in the COCs for the purpose of the RD. Containment of the Main COCs should also contain other chemicals, including benzene, toluene and other fuel related compounds, identified in the 2010 RI as chemicals exceeding screening levels.

2.4.2 Distribution

The distribution of Main COCs within and in the vicinity of the RDWA was evaluated as part of the data gaps analysis (PDIWP, H+A, In Press). The following provides a summary of the current understanding of the general distribution of Main COCs in the RDWA. The distribution of COCs will be refined during the PDI to define the target zone for the NE and CE extraction wellfields and will be discussed in more detail in the PDI Report.

- Of the Main COC VOCs, PCE and TCE exceeded their respective MCLs over the largest area and greatest depth within the RDWA. Both of these compounds are common solvents used/handled by many sites within the RDWA and OU2. The concentrations of these two compounds are generally greatest in the vicinity of source sites in shallow groundwater and have not been detected exceeding MCLs in monitoring wells deeper than 200 feet within the RDWA[1]. In addition, the concentration of these two compounds generally decreases toward the southern end of the CE Area; although there has been detection of relatively elevated concentrations of these compounds to the south of the RDWA, indicating the presence of source areas in the LE to the south of the CE Area.
- Freon 11 and Freon 113 were detected at lower concentrations and within the overall extent of areas of PCE and TCE detections. Freon 11 and Freon 113 were known to be used by businesses in OU2 and the types of businesses known to operate currently and historically in OU2 were the types of businesses that frequently utilized Freons. Freons are ubiquitous compounds, and Freon 11 and Freon 113 uses included dry cleaning, cold cleaning electrical parts, vapor phase cleaning, photographic film and magnetic tape cleaning, use in refrigerants, use in blowing agents, use in oil field activities, use in fire extinguishing, use in

[1] Note that the majority of the OU2 monitoring wells are not deeper than 200 feet below ground surface. Of the 28 well locations shown in Figure 6, only wells MW25D (209 feet below ground surface), MW26D (205 feet below ground surface), and Hawkins (252, 296, 388, and 490 feet below ground surface) are screened deeper than 200 feet below ground surface.

propellants, and use in oil field activities. Freon was also commonly found in both automotive and industrial waste oils.

- The remaining Main COC VOCs are generally within the overall extent of PCE and TCE.
- 1,4-Dioxane has been detected exceeding the NL over an area and depth similar to PCE and TCE, although at generally lower concentrations. This compound is often associated with the common solvent 1,1,1-TCA, which has been used/handled by many sites within the RDWA. 1,4-Dioxane has not been analyzed in as many groundwater sample locations as VOCs; however, the concentration of 1,4-dioxane is generally greatest in the vicinity of source sites in shallow groundwater and has not been detected exceeding the NL in monitoring wells deeper than 200 feet within the RDWA[2].
- Hexavalent chromium has been detected exceeding the MCL over a relatively wide area of the RDWA, although it does not appear to be as extensive as PCE and TCE or 1,4-dioxane. Hexavalent chromium has not been analyzed in as many groundwater sample locations as VOCs; however, the concentration of hexavalent chromium is generally greatest in the vicinity of source sites in shallow groundwater and has not been detected exceeding the MCL in monitoring wells deeper than 200 feet within the RDWA[3].

[2] See footnote 1 on previous page.
[3] See footnote 1 on previous page.

3. PROJECT ORGANIZATION

3.1 Groundwater Monitoring

Groundwater monitoring will be conducted to provide current information on the extent and movement of contaminated groundwater to support the RD and baseline information to be used in future evaluations of RA performance. The SWDs will submit a WAMP for EPA approval.

The WAMP field tasks will be conducted by qualified contractors that will be responsible for implementation in accordance with the WAMP as approved by EPA. Annual groundwater reports will be prepared by a qualified contractor in accordance with the WAMP as approved by EPA. Qualified contractors will be responsible for preparing the annual reports and may rely on documents prepared by field implementation contractor(s) and/or other qualified contractors.

3.2 Project Coordinator

The SWDs' Project Coordinator is the individual who represents the SWDs and is responsible for the overall coordination of the Work. In accordance with the 2016 CD, this SWD Project Coordinator must have sufficient technical expertise to conduct the Work and may not be an attorney representing any SWDs in this matter and may not act as the Supervising Contractor. The SWDs' Project Coordinator may assign other representatives, including other contractors, to assist in coordinating the Work. It is anticipated that Jack Keener of de maximis, inc. will be the SWD's Project Coordinator.

4. DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) were developed under EPA *Guidance on Systematic Planning Using the Data Quality Objectives Process, QA/G-4, EPA/240/B-06/001* (EPA, 2006). The DQO Process is used to develop performance and acceptance criteria (or data quality objectives) that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions. The steps to the DQO process are:

- Step 1 – State the problem;
- Step 2 – Identify the goals of the study;
- Step 3 – Identify information inputs;
- Step 4 – Define the boundaries of the study;
- Step 5 – Develop the analytical approach;
- Step 6 – Specify performance or acceptance criteria; and
- Step 7 – Develop the plan for obtaining data.

Project DQOs were developed as described below and are detailed in tabular format in Table 2.

The first step of the DQO process is to identify the overall purpose of the study. Design and implementation of the NE/CE Area Remedial Action requires current data describing the distribution of the groundwater with COCs exceeding the relevant regulatory guidelines, as well as the gradients that affect the groundwater's lateral and vertical movement. This information will be used to finalize the design of the NE/CE Area Remedial Action and will also provide a baseline to which the Remedial Action data can be compared. This information will be needed until the NE/CE Area Remedial Action is operational. Therefore, the following problem statement was defined for the WAMP:

- There is a need to monitor groundwater chemistry and movement within OU2 in the period between the Consent Decree entry and remedy operation.

Based on this need, two study goals were identified as follows:

- Monitor horizontal and vertical groundwater gradients in wells within the monitoring network; and
- Monitor the distribution of COCs in wells within the monitoring network.

The following sections describe the DQO process for steps 3 through 7 for each of the study goals.

4.1 Monitor Horizontal and Vertical Groundwater Gradients

Step 3 – Determining groundwater gradients requires collection of depth-to-water measurements at multiple locations in the Work Area. Depth-to-water measurements are converted to groundwater elevations using the surveyed elevation of the tops of the well casing. The following information will be used as inputs to monitor groundwater flow within OU2:

- Annual depth to water measurements performed in the Work Area monitoring wells; and
- Top of casing point of reference elevation from surveying of the Work Area monitoring wells.

Step 4 – The spatial boundaries for this WAMP are specified in the SOW and consist of the following monitoring wells:

- MW1 through MW32 (installed by EPA) and new wells installed by the SWDs as part of the PDI;
- Koontz and Hawkins wells (installed by the Water Replenishment District of Southern California (WRD); and
- New wells installed by the SWDs as part of the LEI.

Depth intervals that need to be monitored include the following:

- For MW1 through MW32 and new wells installed by the SWDs as part of the PDI, all screened depth intervals will be monitored;
- For Koontz and Hawkins wells, all screened depth intervals; and
- For new wells installed by the SWDs as part of the LEI, all screened intervals.

Monitoring activities will begin upon EPA approval of this WAMP and will continue on an annual basis until the NE/CE Area Remedial Action is operational; that is, construction and startup activities have been completed. Annual monitoring events would provide sufficient frequency to characterize the horizontal and vertical gradients; however, more frequent measurements may be conducted if needed for remedy design as specified in the PDIWP (H+A, In Press).

Potential practical constraints that could limit planned data collection were identified and include the following:

- Obtaining access to the monitoring wells;
- Damaged wells; and
- Insufficient water in wells for sampling.

Step 5 – Depths to groundwater will be measured to the nearest one hundredth of one foot (0.01 foot). Groundwater elevations will be calculated using the depth to water measurements, and top of casing surveyed elevations for the monitoring wells. The top of casing elevations of the monitoring wells must be surveyed relative to mean sea level to the nearest 0.01 foot by a State of California Licensed Land Surveyor. Consistent with requirements for the State of California, latitude and longitude must be determined with Third Order methods using a minimum of two reference points: California Spatial Reference System Horizontal (CSRS-H) or two horizontal geodetic control points derived from the CSRS-H. Monitoring well locations must be tied into NAD83 UTM Zone 11 datum horizontally and NAVD88 datum vertically. The depths to groundwater and calculated groundwater elevations in each monitoring well will be presented in tables and figures to evaluate the direction of the horizontal and vertical gradients. Horizontal gradients across the Work Area will be calculated for monitoring wells with screened intervals at or near the water table and presented on a potentiometric surface map, whereas vertical gradients will be presented in tabular format for individual well clusters.

Step 6 – Acceptance criteria include confirmation that measurements are collected accurately to within 0.01 foot by repeating the measurement if the difference between the current and previous measurement is greater than 1.0 foot and preparing legible and accurate field notes. Errors will be minimized by adhering to the field quality assurance/quality control (QA/QC) protocols established in the Quality Assurance Project Plan (QAPP) (Appendix A) and Field Sampling Plan (FSP) (Appendix B).

Step 7 – Water levels will be measured manually using a QED®, Solinst® or comparable electric water level sounder. Although not currently planned as part of the WAMP, pressure transducers and data loggers may also be installed and used to record water levels over an extended period. The plan for collecting water level data was developed based on the preceding steps and is outlined in Section 5.

4.2 Monitor the Distribution of COCs

Step 3 – Groundwater monitoring activities need to include collection of groundwater samples from multiple depths and locations in the Work Area, laboratory analysis of the samples for COCs, and analytical results that can be readily compared to appropriate action levels for each COC. The action level for each COC is the EPA or State MCLs, or in the absence of an MCL, NLs established by the California State Water Resources Control Board Division of Drinking Water. More specifically, the following information would be used as inputs to determining the distribution of COCs in the Work Area monitoring wells:

- Groundwater samples collected during annual monitoring events for analysis of the Main COCs:
    - VOCs by EPA Method 8260B:
        - TCE;
        - PCE;
        - Freon 11;
        - Freon 113;
        - 1,1-DCE;
        - cis-1,2-DCE;
        - Chloroform;
        - Carbon tetrachloride;
        - 1,1-DCA;
        - 1,2-DCA; and

    - 1,1,1-TCA;
  - 1,4-Dioxane by EPA Method 8270C SIM; and
  - Hexavalent chromium by EPA Method 218.6;
- MCLs: TCE 5 micrograms per liter (µg/L), PCE 5 µg/L, Freon 11 150 µg/L, Freon 113 1,200 µg/L, 1,1-DCE 6 µg/L, cis-1,2-DCE 6 µg/L, chloroform 80 µg/L[4], carbon tetrachloride 0.5 µg/L, 1,1-DCA 5 µg/L, 1,2-DCA 0.5 µg/L, 1,1,1-TCA 200 µg/L, and hexavalent chromium 10 µg/L; and
- NL: 1,4-dioxane 1 µg/L.

Step 4 – The spatial boundaries for this WAMP are specified in the SOW and consist of the following monitoring wells:

- MW1 through MW32 and new wells installed by the SWDs as part of the PDI;
- Koontz and Hawkins wells; and
- New wells installed by the SWDs as part of the LEI.

Depth intervals that need to be monitored include the following:

- For MW1 through MW32 and new wells installed by the SWDs as part of the PDI, all screened depth intervals will be monitored;
- For Koontz and Hawkins wells, all screened depth intervals; and
- For new wells installed by the SWDs as part of the LEI, all screened intervals.

Monitoring activities will begin upon EPA approval of this WAMP and will continue on an annual basis until the NE/CE Area Remedial Action is operational; that is, construction and startup activities have been completed. Annual monitoring events would provide sufficient frequency to characterize the groundwater chemistry; however, more frequent monitoring may be conducted if needed for remedy design as specified in the PDIWP (H+A, In Press).

[4] The MCL is for total trihalomethanes, which include bromodichloromethane, bromoform, chloroform, and dibromochloromethane

Potential practical constraints that could limit planned data collection were identified and include the following:

- Obtaining access to the monitoring wells;
- Damaged wells; and
- Insufficient water in wells for sampling.

Step 5 – The following approach was developed to characterize the distribution of COCs within OU2:

- Samples will be collected from the Work Area monitoring wells and sent to a California-certified laboratory for analysis of VOCs, 1,4-dioxane, and hexavalent chromium. The reporting limits (RLs) for the Main COCs based on the laboratory analytical methods are as follows: TCE 0.5 µg/L, PCE 0.5 µg/L, Freon 11 0.5 µg/L, Freon 113 0.5 µg/L, 1,1-DCE 0.5 µg/L, cis-1,2-DCE 0.5 µg/L, chloroform 0.5 µg/L, carbon tetrachloride 0.5 µg/L, 1,1-DCA 0.5 µg/L, 1,2-DCA 0.5 µg/L, 1,1,1-TCA 0.5 µg/L, 1,4-dioxane 1.0 µg/L, and hexavalent chromium 1.0 µg/L;
- After laboratory analytical results are obtained, the laboratory data will be subjected to a Stage 2A data validation. Approximately 10% of the data received from the laboratory will be subjected to a Stage 4 data validation. The QAPP (Appendix A) provides specific procedures for the data validation and which QC elements are included in the data validation stages;
- Following QA/QC review, the concentrations of Main COCs in the Work Area monitoring wells will be compared to the MCLs and NLs. The RLs are lower than or equal to the respective action level for each Main COC. Therefore, the analytical data collected during the WAMP will be sufficient to characterize the distribution of Main COCs above the action levels;
- Concentrations of Main COCs (TCE, PCE, Freon 11, Freon 113, 1,1-DCE, cis-1,2-DCE, chloroform, carbon tetrachloride, 1,1-DCA, 1,2-DCA, 1,1,1-TCA, 1,4-dioxane, and hexavalent chromium) will be presented in tables;
- Concentrations of selected Main COCs (PCE, TCE, 1,1-DCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,4-dioxane, and hexavalent chromium) will be reported in figures; and

- Time-series concentration graphs of selected Main COCs (PCE, TCE, 1,1-DCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,4-dioxane, and hexavalent chromium) that represent the trends in selected COC behavior over time will be developed.

Step 6 – Acceptance criteria include confirmation that laboratory data are: (1) representative of the chemical conditions that exist, (2) comparable to subsequent or previously collected data, (3) complete to the extent that necessary conclusions may be obtained, and (4) of known statistical significance in terms of precision and accuracy, at the levels that are appropriate for evaluating COC distribution. Errors will be minimized by adhering to the field QA/QC protocols established in the QAPP (Appendix A) and FSP (Appendix B).

Step 7 – Groundwater samples will be collected using low-flow sampling procedures with either a submersible pump or bladder pump. Each well will be purged, and field parameters will be monitored during purging. Samples will be collected after field parameters have stabilized as described in the Water Quality Parameter Measurements Standard Operating Procedure (SOP) included in the FSP. All samples from the monitoring wells will be analyzed for VOCs by EPA Method 8260B; hexavalent chromium by EPA Method 218.6; and 1,4-dioxane by EPA Method 8270C SIM. Field and laboratory QA/QC samples will be collected and analyzed. The plan for collecting groundwater samples was developed based on the preceding steps and is outlined in Section 5.

5. MONITORING WELL NETWORK

The Work Area monitoring well network consists of the following wells:

- MW1 through MW32, installed by EPA as part of OU2 investigations between 2002 and 2012 and new wells installed by the SWDs as part of the PDI;
- The Koontz and Hawkins wells, installed by the Water Replenishment District of Southern California (WRD) in 2014; and
- New monitoring wells to be installed as part of the LEI.

The wells to be monitored as part of this WAMP are described below.

5.1 Wells and Piezometers Installed as Part of the OU2 Work

Monitoring of the wells installed as part of the OU2 work (MW1 through MW32 and new PDI wells) will be performed in accordance with the SOW (Section 3.5 (a) 3). The construction details for wells installed as part of the OU2 work included in the WAMP are presented in Table 3, and their locations are provided in Figure 6. Construction details and locations of PDI wells will be provided in future reports.

5.2 Koontz and Hawkins Wells

Monitoring of the “Koontz” and “Hawkins” well clusters (located in Santa Fe Springs, California; Figure 6) will be performed in accordance with the SOW (Section 3.5 (a) 3). Each well cluster consists of five monitoring wells installed at different depths. The well construction details and screen intervals are summarized in Table 3.

5.3 Wells to Be Installed as Part of the LEI

Monitoring wells that are installed as part of the LEI will be monitored in accordance with the SOW (Section 5.1 (a) (1) iv). Construction details and locations of LEI wells will be provided in future reports.

5.4 Monitoring Well Substitutions

EPA will consider recommendations to substitute non-EPA wells for certain existing EPA wells (SOW Section 3.5 (c)). Substitutions to the monitoring well network may be proposed in future annual groundwater monitoring reports and documented in future addenda to this WAMP.

6. MONITORING ACTIVITIES

Monitoring activities will be conducted in accordance with the QAPP (Appendix A) and FSP (Appendix B). EPA will be given at least 14 days' notice prior to sample collection activity (SOW Section 7.7 (d) 5) and as documented in the QAPP.

6.1 Water Level Measurements

The procedures for measuring water levels are summarized below and described in Section 3 of the FSP (Appendix B).

Water levels will be measured in monitoring wells manually using a QED®, Solinst® or comparable electric water level sounder. Pressure transducers and data loggers may also be installed and used in wells to monitor and record water levels over an extended period. Resulting depth-to-water data will be recorded and used in conjunction with surveyed measuring point elevation data to calculate groundwater elevations and construct contour maps for the hydrogeologic units of interest. These maps will be used to interpret groundwater flow conditions and to determine horizontal and vertical gradients in OU2. The water level contour maps will also be used to aid in evaluating the distribution and movement of COCs in groundwater. Water level hydrographs will also be prepared to present changes in groundwater elevations over time.

6.2 Sampling Methods and Procedures

The procedures for sampling wells are summarized below and described in Sections 4 and 5 of the FSP (Appendix B).

Groundwater samples will be collected using low-flow sampling procedures at the monitoring wells, piezometers, and wells installed by the WRD. Samples will be collected with either a submersible pump or bladder pump. EPA monitoring wells are equipped with dedicated pump tubing and bladder pumps to be utilized for sampling using low-flow techniques, while wells installed by the WRD are equipped with dedicated tubing. New wells to be installed as part of the PDI and LEI are planned to be equipped with dedicated tubing. Each well will be purged, and field parameters (pH, temperature, specific conductance, dissolved oxygen, and turbidity) will be monitored approximately every 3 to 5 minutes during purging. Samples will be collected after field parameters have stabilized as described in the Water Quality Parameter Measurements SOP included in the FSP.

A bailer will be used to purge and sample a well in the event that the well does not produce sufficient water for purging and sampling with a pump. The well will not be sampled if less than 1 foot of water is present within the screened interval.

6.3 Split Sampling

EPA will be provided at least a 14-day notification of approximate sampling dates (SOW Section 7.7 (d) 5) as documented in the QAPP (Appendix A, Section 4.7). This will allow EPA the time needed to decide from which wells, if any, they will collect split samples. As part of this notification, EPA will be provided a schedule describing the approximate date each well will be sampled. The schedule will remain somewhat flexible to allow for the availability of EPA representatives.

Procedures for split sampling are further detailed in the QAPP.

6.4 Laboratory Analytical Methods

All samples from the monitoring wells will be analyzed for the Main COCs identified in the ESD and ROD (EPA, 2011; EPA, 2016b):

- VOCs by EPA Method 8260B:
    - TCE;
    - PCE;
    - Freon 11;
    - Freon 113;
    - 1,1-DCE;
    - Cis-1,2-DCE;
    - Chloroform;
    - Carbon tetrachloride;
    - 1,1-DCA;
    - 1,2-DCA;
    - 1,1,1-TCA;
- Hexavalent chromium by EPA Method 218.6; and

- 1,4-dioxane by EPA Method 8270C SIM.

Field and laboratory quality assurance/quality control samples will be collected and analyzed in accordance with Section 5 of the FSP.

6.5 Monitoring Frequency

Groundwater elevations and groundwater chemistry will be monitored annually as part of the WAMP until the NE/CE Area Remedial Action construction and startup activities have been completed, that is, until the remedy is operational according to the SOW (Section 3.5 (a) 1). Additional monitoring will be conducted as part of the PDI and LEI as indicated in the respective work plans. The wells to be monitored as part of the WAMP are summarized in Table 3. Once the remedy is operational, monitoring will be performed according to the CMP, as described in the SOW (Section 7.7 (g)).

Wells installed as part of the PDI and the LEI will be monitored in accordance with the schedules outlined in the PDIWP and the LEI Work Plan. Following submission of the PDI and LEI Reports, the PDI and LEI wells will be monitored annually as part of this WAMP.

More frequent monitoring of groundwater elevations is recommended in the PDIWP to support the RD of the NE/CE Area. It is anticipated that this more frequent monitoring of groundwater elevations will also support development and calibration of a NE/CE Area groundwater flow model (SOW Section 3.5 (a) 2). Recommendations for additional groundwater monitoring, if needed, will be based on the Groundwater Flow Modeling Work Plan and documented in an addendum to this WAMP.

6.6 Handling of IDW

IDW generated from groundwater sampling activities described in this WAMP will be containerized, properly labeled, and temporarily stored at an appropriate location to be determined within the Work Area. Samples will be collected for waste profiling and sent to a California-certified laboratory for analysis in accordance with California Code of Regulations, Title 22, Section 66261.24. Following waste profiling, the IDW will be transported by a licensed waste hauler for disposal at an appropriately permitted solid or hazardous waste facility in accordance with Federal and State requirements, including valid EPA CERCLA Off-Site Rule approval (40 CFR 300.440). IDW will be stored for no more than 60 days during characterization and consolidation. Handling of investigation-derived waste is described in Section 6 of the FSP (Appendix B).

7. DATA MANAGEMENT

Data management procedures outlined in the QAPP (Appendix A) and the FSP (Appendix B) will be adopted to ensure that data collected and submitted during Work Area monitoring activities will be internally consistent and of acceptable quality.

8. DATA REPORTING

All analytical data, whether validated or not, will be submitted to EPA and the DTSC in electronic data deliverables format within 45 days of sample shipment to the laboratory or 14 days after receipt of analytical results from the laboratory, whichever occurs first (SOW Section 8.2, item 12).

Results of monitoring activities will be presented in annual Work Area Monitoring Reports (Monitoring Reports), submitted 60 days after receipt of final laboratory reports from Work Area samples (SOW Section 8.2, item 7). In accordance with Section 3.5 (e) of the SOW, each Monitoring Report will include:

- A summary of the monitoring activities performed;
- A summary of monitoring results, including a narrative interpretation of data and graphs, a tabular summary of validated results, hydrographs, time-series graphs for PCE, TCE, 1,1-DCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,4-dioxane, and hexavalent chromium and maps depicting interpreted water levels and concentrations of PCE, TCE, 1,1-DCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,4-dioxane and hexavalent chromium; and
- Data validation reports and laboratory reports.

The results summary will include a summary of relevant groundwater data collected by SWDs that is not specifically being collected for OU2 work, as well as other publicly or readily available data generated by third parties for wells that are in or near OU2. Specifically, this additional groundwater data will include data collected from the OW series wells as part of OU1 monitoring as well as data collected from the Golden State Water Company's Pioneer wells. EPA assistance may be required to obtain third party data.

9. WORK AREA MONITORING SCHEDULE

In accordance with the SOW (Section 8.2, item 1), Work Area monitoring will begin in the first calendar quarter following EPA approval of this WAMP.

Monitoring in the Work Area will continue at the frequency described in Section 6.5 until the NE/CE Area Remedial Action is operational. Monitoring will be performed in accordance with the CMP once the remedy is operational.

10. REFERENCES

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TABLES

TABLE 1

Main Compounds of Concern

Main Compounds of Concern (COCs)	
Volatile Organic Compounds	Trichloroethene (TCE)
	Tetrachloroethene / Perchloroethene (PCE)
	Trichlorofluoromethane (Freon 11)
	1,1,2-Trichloro-1,2,2,-trifluoroethane (Freon 113)
	1,1-Dichloroethene (1,1-DCE)
	cis-1,2-Dichloroethene (cis-1,2-DCE)
	chloroform
	carbon tetrachloride
	1,1-Dichloroethane (1,1-DCA)
	1,2-Dichloroethane (1,2-DCA)
	1,1,1-Trichloroethane (1,1,1-TCA)
Other	1,4-dioxane
	hexavalent chromium

Table 2 - Data Quality Objectives for Groundwater Monitoring
Omega Superfund Site
Operable Unit 2

Step 1 - Problem Statement / Objective		**There is a need to monitor groundwater chemistry and movement within OU2 in the period between the Consent Decree entry and remedy operation.**	
Step 2 - Principal Study Goals	*Principal Study Goals*	1. Monitor the horizontal and vertical groundwater gradients in wells within the monitoring network.	2. Monitor the distribution of COCs in wells within the monitoring network.
	Potential Outcomes	Measure groundwater elevations in the Work Area monitoring wells to evaluate the horizontal groundwater gradients in the Work Area and the vertical groundwater gradients at monitoring well clusters.	Collect samples for laboratory analysis to obtain COC data from the Work Area monitoring wells to further characterize the distribution of COCs in the Work Area
Step 3 - Inputs to the Decision	*Needed Information*	Annual depth to water measurements in the Work Area monitoring wells and top of casing point of reference elevation from surveying of the Work Area monitoring wells	Analytical data of Main COC concentrations at Work Area monitoring wells: TCE, PCE, Freon 11, Freon 113, 1,1-DCE, cis-1,2-DCE, chloroform, carbon tetrachloride, 1,1-DCA, 1,2-DCA, 1,1,1-TCA, 1,4-dioxane, and hexavalent chromium
	Source of Needed Information or Data	Depth-to-water measurement performed during annual monitoring events and top of casing point of reference elevation data from surveying of the Work Area monitoring wells upon well completion	Groundwater samples collected annually from Work Area monitoring wells
	Action Levels µg/L	NA	Maximum Contaminant Levels and Notification Levels MCLs: TCE (5µg/L), PCE (5µg/L), Freon 11 (150µg/L), Freon 113 (1,200µg/L), 1,1-DCE (6µg/L), cis-1,2-DCE (6µg/L) chloroform (80µg/L*), carbon tetrachloride (0.5µg/L), 1,1-DCA (5µg/L), 1,2-DCA (0.5µg/L), 1,1,1-TCA (200µg/L), and hexavalent chromium (10µg/L) NL: 1,4-dioxane (1µg/L)
	Field Methods	Water level measurements and surveying at Work Area monitoring wells	Groundwater sampling from Work Area monitoring wells
	Analytical Methods	NA	VOCs by USEPA Method 8260B Hexavalent chromium by USEPA Method 218.6 1,4-dioxane by USEPA Method 8270C SIM
Step 4 - Study Boundaries		***Target Population***	
		Monitoring well locations (MW1 through MW32; new wells installed as part of the PDI; Koontz and Hawkins wells; new wells installed as part of the LEI and PDI) that will characterize the groundwater gradients within OU2.	Monitoring well locations (MW1 through MW32; Koontz and Hawkins wells; new wells installed as part of the LEI) that will characterize the distribution of contaminated groundwater within OU2. Groundwater samples will be collected in a sufficient volume to analyze for compounds and constituents listed in Step 3.
		Spatial Boundaries	
		The OU2 Work Area is defined in Attachment C of the Consent Decree. Monitoring wells and depths to be monitored include: MW1 through MW32 and new wells installed by the SWDs as part of the PDI, all screened depth intervals; Koontz and Hawkins wells, all screened depth intervals; new wells installed by the SWDs as part of the LEI, all screened intervals to a depth of 500 feet.	
		Temporal Boundaries	
		To be initiated upon EPA approval of the Work Area Monitoring Plan and conducted annually until the NE/CE Remedial Action is operational. New LEI and PDI monitoring wells to be monitored in accordance with LEI and PDI Work Plans until respective reports submitted to EPA, then monitored annually as part of Work Area Monitoring Plan until the NE/CE Remedial Action is operational.	
		Potential Practical Constraints	
		Well access constraints, damaged wells, insufficient water in wells for sampling	
Step 5 - Decision Rules/Analytic Process		***Parameter that Characterizes Population of Interest***	
		The parameters that characterize the population of interest are individual data points (water levels and COC concentrations) measured at the Work Area monitoring wells	

Table 2 - Data Quality Objectives for Groundwater Monitoring
Omega Superfund Site
Operable Unit 2

Step 5 - Decision Rules/Analytic Process (Continued)	***Action Levels (µg/L) for Study***	
	NA	Action levels are presented in Step 3.
	Reporting Limits (µg/L)	
	NA	The reporting limits are lower than or equal to the action levels (Step 3). RLs: TCE (0.50µg/L), PCE (0.50µg/L), Freon 11 (0.50µg/L), Freon 113 (0.50µg/L), 1,1-DCE (0.50µg/L), cis-1,2-DCE (0.50µg/L), chloroform (0.50µg/L), carbon tetrachloride (0.50µg/L), 1,1-DCA (0.50µg/L), 1,2-DCA (0.50µg/L), 1,1,1-TCA (0.50µg/L), 1,4-dioxane (1.0µg/L), and hexavalent chromium (1.0µg/L)
	Analytic Process/Decision Rule	
	Depths to groundwater will be measured to the nearest one hundredth of one foot (0.01 foot). Groundwater elevations will be calculated using the depth to water measurements, and top of casing surveyed elevations for the monitoring wells. The top of casing elevations of the monitoring wells must be surveyed relative to mean sea level to the nearest 0.01 foot by a State of California Licensed Land Surveyor. The depths to groundwater and calculated groundwater elevations in each monitoring well will be presented in tables and figures to evaluate the direction of the horizontal and vertical gradients. Horizontal gradients across the Work Area will be calculated for the water table interval and presented on potentiometric surface maps, whereas vertical gradients will be presented in tabular format for individual well clusters.	Concentrations of Main COCs (TCE, PCE, Freon 11, Freon 113, 1,1-DCE, cis-1,2-DCE, chloroform, carbon tetrachloride, 1,1-DCA, 1,2-DCA, 1,1,1-TCA, 1,4-dioxane, and hexavalent chromium) will be presented in tables and select figures. Time series graphs of selected Main COCs concentrations (PCE, TCE, 1,1-DCE, cis-1,2-DCE, 1,1-DCA, 1,2-DCA, 1,4-dioxane, and hexavalent chromium) that represent the extent of contaminated groundwater will be developed.
Step 6 - Tolerable Limits on Decision Rules	Acceptance criteria include confirmation that measurements are collected accurately and preparing legible and accurate field notes. Errors will be minimized by adhering to the field QA/QC protocols established in the QAPP (Appendix A) and FSP (Appendix B).	Acceptance criteria include confirmation that laboratory data are: (1) representative of the chemical conditions that exist, (2) comparable to subsequent or previously collected data, (3) complete to the extent that necessary conclusions may be obtained, and (4) of known statistical significance in terms of precision and accuracy, at the levels that are appropriate for evaluating COC distribution. Errors will be minimized by adhering to the field QA/QC protocols established in the QAPP (Appendix A) and FSP (Appendix B).
Step 7 - Plan for Obtaining Data	Water levels will be measured manually using a QED®, Solinst® or comparable electric water level sounder. Pressure transducers and data loggers may also be installed and used to record water levels over an extended period.	Groundwater samples will be collected using low-flow sampling procedures with either a submersible pump or bladder pump. Each well will be purged, and field parameters will be monitored during purging. Samples will be collected after field parameters have stabilized as described in the Water Quality Parameter Measurements Standard Operating Procedure (SOP) included in the FSP. All samples from the monitoring wells will be analyzed for VOCs by EPA Method 8260B; hexavalent chromium by EPA Method 218.6; and 1,4-dioxane by EPA Method 8270C SIM. Field and laboratory QA/QC samples will be collected and analyzed.

Table 2 - Data Quality Objectives for Groundwater Monitoring
Omega Superfund Site
Operable Unit 2

Notes:

* - Total trihalomethanes = Bromodichloromethane, Bromoform, Chloroform, Dibromochloromethane

µg/L: micrograms per liter
1,1-DCA: 1,1-Dichloroethane
1,1-DCE: 1,1-Dichloroethene
1,1,1-TCA: 1,1,1-Trichloroethane
1,2-DCA: 1,2-Dichloroethane
cis-1,2-DCE: cis-1,2-Dichloroethene
COCs: chemicals of concern
EPA: United States Environmental Protection Agency
FSP: Field Sampling Plan
Freon 11: trichlorofluoromethane
Freon 113: 1,1,2-Trichloro-1,2,2,-trifluoroethane
LE: Leading Edge
LEI: Leading Edge Investigation
Main COCs: main chemicals of concern
MCLs: maximum contaminant levels
NA: not applicable
NE/CE: Northern Extraction/Central Extraction
NL: notification level
OU2: Operable Unit 2
PCE: Tetrachloroethene
PDI: Pre-Design Investigation
QAPP: Quality Assurance Project Plan
QA/QC: Quality Assurance/Quality Control
RL: Reporting Limit
TCE: trichloroethene
VOCs: Volatile Organic Compounds
WAMP: Work Area Monitoring Plan

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Drinking Water Notification Levels and Response Levels: An Overview. Division of Drinking Water State Water Resources Control Board. February 4, 2015
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Table 3 - Well Construction Summary
Omega Superfund Site
Operable Unit 2

Well ID	X Coordinate (meters)	Y Coordinate (meters)	Surface Elevation (feet amsl)	TOC Elevations[a] (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Total Depth (feet bgs)	Total Depth Drilled (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Screen Material	Screen Slot Size (inches)	Casing Material	Filter Pack Grade	Filter Pack Top (feet bgs)	Filter Pack Bottom (feet bgs)	Drilling Method	Annual Seal Material	Annular Seal Top (feet bgs)	Annular Seal Bottom (feet bgs)
Wells installed as part of the OU2 work																				
EPA_MW1A	402749.9	3759022.8	157.81	157.71	45	60	60	60	10	4	SCH40 PVC	0.02	SCH40 PVC	3	41.5	60	Hollow-stem auger	95/5 slurry medium chips	1 35	35 42
EPA_MW1B	402750.0	3759020.3	158.1	158.05	75	85.4	85.4	95	10	4	SCH40 PVC	0.02	SCH40 PVC	3	72	86	Hollow-stem auger	95/5 slurry benonite pellets	1 67	67 72
EPA_MW2	402799.5	3758870.2	154.24	154.21	45	60	60	60	10	4	SCH40 PVC	0.02	SCH40 PVC	3	42.5	60	Hollow-stem auger	95/5 slurry benonite pellets	1 38	38 42
EPA_MW3	402931.5	3758376.5	151.86	151.48	38	48	48	51.3	10	4	SCH40 PVC	0.02	SCH40 PVC	3	35.5	48	Hollow-stem auger	95/5 slurry benonite chips	1 32	32 36
EPA_MW4A	402537.1	3758403.1	147.02	146.8	42.7	53	53	53	10	4	SCH40 PVC	0.02	SCH40 PVC	3	38.5	53	Hollow-stem auger	95/5 slurry benonite chips	1 36	36 38.5
EPA_MW4B	402539.7	3758404.9	147	146.84	69.7	80	80	125	10	2	SCH40 PVC	0.02	SCH40 PVC	3	67	80	Mud rotary	95/5 slurry benonite chips/pellets	1 61.5	61.5 67
EPA_MW4C	402539.9	3758404.7	147.39	147.1	88.7	99	99	125	10	2	SCH40 PVC	0.02	SCH40 PVC	3	85	99.5	Mud rotary	bentonite pellets	80	85
EPA_MW5	402519.7	3758708.0	150.84	150.6	43.3	53.3	53.3	53	10	4	SCH40 PVC	10.00	SCH40 PVC	3	40.5	53.3	Hollow-stem auger	95/5 slurry benonite chips	1 34	34 40.5
EPA_MW6	402213.8	3758823.6	150.39	150.28	37.1	47.5	47.5	47.5	10	4	SCH40 PVC	0.02	SCH40 PVC	3	35	47.5	Hollow-stem auger	95/5 slurry benonite pellets	1 32	32 35
EPA_MW7	402772.1	3757891.0	143.59	143.28	35.8	46	46	46	10	4	SCH40 PVC	0.02	SCH40 PVC	3	31	46	Hollow-stem auger	95/5 slurry benonite chips	1 28	28 31
EPA_MW8A	402025.0	3758460.8	150.44	150.14	30	45	45	45	10	4	SCH40 PVC	0.02	SCH40 PVC	3	27	45	Hollow-stem auger	95/5 slurry benonite chips	1 22	22 27
EPA_MW8B	402028.6	3758457.8	150.33	150.03	65	75	75	93	10	2	SCH40 PVC	0.02	SCH40 PVC	3	63	75	Hollow-stem auger	95/5 slurry benonite pellets	1 59	59 63
EPA_MW8C	402028.5	3758457.8	150.33	150.03	86.7	91.7	91.7	93	10	2	SCH40 PVC	0.02	SCH40 PVC	3	84	93	Hollow-stem auger	bentonite pellets	75	83.5
EPA_MW8D	402021.5	3758462.1	150.09	149.91	110	120	120	150	10	4	SCH40 PVC	0.02	SCH40 PVC	3	108	122.5	Mud rotary	95/5 slurry benonite pellets	1 103	103 108
EPA_MW9A	401709.6	3758510.4	148.88	148.84	25	35	35	90	10	4	SCH40 PVC	0.02	SCH40 PVC	3	23	35	Hollow-stem auger	95/5 slurry benonite chips	1 18	18 23
EPA_MW9B	401711.9	3758510.2	149.06	148.9	49.8	60	60	65	10	4	SCH40 PVC	0.02	SCH40 PVC	3	47	65	Hollow-stem auger	95/5 slurry benonite pellets	1 44	44 47
EPA_MW10	402019.5	3757645.7	147.4	147.45	52	62	62	65	10	4	SCH40 PVC	0.02	SCH40 PVC	3	49	65	Hollow-stem auger	95/5 slurry benonite pellets	1 45	45 49
EPA_MW11	402265.9	3757445.4	150.94	150.89	40	50	50	55	10	4	SCH40 PVC	0.02	SCH40 PVC	3	38	55	Hollow-stem auger	95/5 slurry benonite chips	1 31	31 37
EPA_MW12	403349.2	3759544.1	220.53	220.87	82	97	102.18	102	6	2	SCH80 PVC	0.01	SCH80 PVC	30	80	102	Sonic	95/5 slurry	1	80
EPA_MW13A	403429.3	3759304.3	206.33	206.02	56	66	72.2	71	10	2	SCH80 PVC	0.02	SCH80 PVC	2/16	54	69	Mud rotary	95/5 slurry medium chips	1 52	52 54
EPA_MW13B	403429.3	3759304.3	206.33	205.88	123	133	138.4	138	10	2	SCH80 PVC	0.02	SCH80 PVC	2/16	121	139	Mud rotary	medium chips 1:1 medium chips	69 71 119	71 119 121
EPA_MW14	403113.2	3759053.9	172.97	172.63	60	75	79.91	80	6	2	SCH80 PVC	0.02	SCH80 PVC	2/12	57	80	Sonic	95/5 slurry medium chips	1 55	55 57
EPA_MW15	402532.7	3758539.7	148.65	148.28	50	70	74.95	75	6	2	SCH80 PVC	0.01	SCH80 PVC	2/12	48	75	Sonic	95/5 slurry medium chips	1 46	46 48
EPA_MW16A	401492.8	3757951.1	153.47	153.19	45	60	65.93	65	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	43	60	Mud rotary	95/5 slurry medium chips	1 40	40 43
EPA_MW16B	401492.8	3757951.1	153.47	153.19	106	116	120.19	121	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	104	118	Mud rotary	1:1 medium chips	65 102	102 104
EPA_MW16C	401492.8	3757951.1	153.47	153.26	149	164	169.7	169	8.75	2	SCH80 PVC	0.02	SCH80 PVC	3	147	169	Mud rotary	medium chips 1:1 medium chips	118 121 145	121 145 147
EPA_MW17A	401264.2	3757463.4	159.4	159.03	56	71	75.67	76	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	54	73	Mud rotary	95/5 slurry medium chips	1 52	52 54
EPA_MW17B	401264.2	3757463.4	159.4	158.9	94	104	109.7	109	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	92	107	Mud rotary	medium chips 1:1 medium chips	73 76 90	76 90 92
EPA_MW17C	401264.2	3757463.4	159.4	159	172	182	187.15	187	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	170	190	Mud rotary	medium chips 1:1 medium chips	107 109 168	109 168 170
EPA_MW18A	402590.6	3757631.1	144.32	143.73	56	71	75.95	76	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	54	76	Mud rotary	95/5 slurry medium chips	1 52	52 54
EPA_MW18B	402590.6	3757631.1	144.32	143.83	90	100	105.47	105	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	88	103	Mud rotary	1:1 medium chips	76 86	86 88

Table 3 - Well Construction Summary
Omega Superfund Site
Operable Unit 2

Well ID	X Coordinate (meters)	Y Coordinate (meters)	Surface Elevation (feet amsl)	TOC Elevations[a] (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Total Depth (feet bgs)	Total Depth Drilled (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Screen Material	Screen Slot Size (inches)	Casing Material	Filter Pack Grade	Filter Pack Top (feet bgs)	Filter Pack Bottom (feet bgs)	Drilling Method	Annual Seal Material	Annular Seal Top (feet bgs)	Annular Seal Bottom (feet bgs)
EPA_MW18C	402590.6	3757631.1	144.32	143.83	146	161	166.6	166	8.75	2	SCH80 PVC	0.02	SCH80 PVC	2/16	144	164	Mud rotary	medium chips 1:1 medium chips	103 105 142	105 142 144
EPA_MW19	401687.1	3756760.9	159.01	158.73	56	71	74.8	76	6	2	SCH80 PVC	0.02	SCH80 PVC	2/16	54	76	Sonic	95/5 slurry medium chips	1 52	51 54
EPA_MW20A	400670.8	3756601.7	142.07	141.31	75	90	94.7	95	10	2	SCH80 PVC	0.02	SCH80 PVC	2/12	73	87	Mud rotary	95/5 slurry medium chips	1 70	70 73
EPA_MW20B	400670.8	3756601.7	142.07	141.32	122	132	137.7	137	10	2	SCH80 PVC	0.02	SCH80 PVC	2/12	120	137	Mud rotary	medium chips 1:1 medium chips	87 89 118	89 118 120
EPA_MW20C	400670.8	3756601.7	142.07	141.35	180	190	195.2	195	10	2	SCH80 PVC	0.02	SCH80 PVC	2/12	178	196	Mud rotary	medium chips 1:1 medium chips	132 134 176	134 176 178
EPA_MW21	400223.3	3756894.0	129.27	128.81	64	79	84.8	84	6	2	SCH80 PVC	0.02	SCH80 PVC	2/16	61	83	Sonic	95/5 slurry medium chips	1 59	59 61
EPA_MW22	400466.2	3757381.9	151.47	150.82	74	89	93.83	94	6	2	SCH80 PVC	0.02	SCH80 PVC	2/16	71	94	Sonic	95/5 slurry medium chips	1 68	68 71
EPA_MW23A	402207.2	3758346.4	149.07	148.76	35	55	60	62	8	4	SCH80 PVC	0.02	SCH80 PVC	3	32	62	Sonic	95/5 slurry medium chips	1 26	26 32
EPA_MW23B	402203.8	3758349.2	149.36	149.06	82	97	101.6	102	10	2	SCH80 PVC	0.02	SCH80 PVC	2/16	86	99	Mud rotary	95/5 slurry transitional sand	1 85	85 86
EPA_MW23C	402203.8	3758349.2	149.36	149.07	145	160	164.55	165	10	2	SCH80 PVC	0.02	SCH80 PVC	2/16	143	162	Mud rotary	medium chips 1:1 transitional sand	99 102 142	102 142 143
EPA_MW23D	402203.8	3758349.2	149.36	148.04	175	185	189.8	190	10	2	SCH80 PVC	0.02	SCH80 PVC	2/16	173	190	Mud rotary	medium chips 1:1 transitional sand	161 164 171	164 171 173
EPA_MW24A	402993.5	3758908.7	162.44	162.04	50	70	75	200	16	4	SCH80 PVC	0.02	SCH80 PVC	3	47	75	Mud rotary	95/5 slurry medium chips	1 40	40 47
EPA_MW24B	402993.4	3758908.8	162.44	162.03	110	125	130	200	16	2	SCH80 PVC	0.02	SCH80 PVC	3	107	130	Mud rotary	1:1 medium chips	75 100	100 107
EPA_MW24C	402993.4	3758909.0	162.44	162.02	140	160	165	200	16	4	SCH80 PVC	0.02	SCH80 PVC	3	137	163	Mud rotary	medium chips	130	137
EPA_MW24D	402993.5	3758908.9	162.44	162.05	173	178	183	200	16	2	SCH80 PVC	0.02	SCH80 PVC	3	170	185	Mud rotary	medium chips	163	170
EPA_MW25A	401814.6	3757890.6	148.25	147.9	45	65	70	220	14.5	4	SCH80 PVC	0.02	SCH80 PVC	3	41	71	Mud rotary	95/5 slurry medium chips	1 35	35 41
EPA_MW25B	401814.5	3757890.6	148.25	147.84	90	110	115	220	14.5	2	SCH80 PVC	0.02	SCH80 PVC	3	85	116	Mud rotary	1:1 medium chips	71 80	80 85
EPA_MW25C	401814.5	3757890.6	148.25	147.86	140	150	155	220	14.5	4	SCH80 PVC	0.02	SCH80 PVC	3	135	156	Mud rotary	1:1 medium chips	116 130	130 135
EPA_MW25D	401814.5	3757890.6	148.25	147.87	194	209	214	220	14.5	2	SCH80 PVC	0.02	SCH80 PVC	3	189	220	Mud rotary	1:1 medium chips	156 184	184 189
EPA_MW26A	401270.1	3757125.2	155.98	155.62	70	90	95	250	14.5	4	SCH80 PVC	0.02	SCH80 PVC	3	65	93	Mud rotary	95/5 slurry medium chips	1 57	57 65
EPA_MW26B	401269.9	3757125.1	155.98	155.45	105	120	125	250	14.5	2	SCH80 PVC	0.02	SCH80 PVC	3	100	126.5	Mud rotary	medium chips	93	100
EPA_MW26C	401270.0	3757125.3	155.98	155.41	145	160	165	250	14.5	2	SCH80 PVC	0.02	SCH80 PVC	3	140	166	Mud rotary	1:1 medium chips	126.5 135	135 140
EPA_MW26D	401269.9	3757125.2	155.98	155.37	185	205	210	250	14.5	2	SCH80 PVC	0.02	SCH80 PVC	3	180	212	Mud rotary	1:1 medium chips	166 175	175 180
EPA_MW27A	400903.0	3755901.8	139.47	139.24	90	110	115	225	14.5	4	SCH80 PVC	0.02	SCH80 PVC	2/12	87	115	Mud rotary	95/5 slurry medium chips	1 78	78 87
EPA_MW27B	400903.1	3755901.7	139.47	139.18	144	164	169	225	14.5	4	SCH80 PVC	0.02	SCH80 PVC	2/12	141	168	Mud rotary	1:1 medium chips	115 130	130 141
EPA_MW27C	400902.9	3755901.7	139.47	139.17	180	190	195	225	14.5	2	SCH80 PVC	0.02	SCH80 PVC	2/12	177	193	Mud rotary	medium chips	168	177
EPA_MW27D	400903.0	3755901.6	139.47	139.13	200	210	215	225	14.5	2	SCH80 PVC	0.02	SCH80 PVC	2/12	197	225	Mud rotary	medium chips	193	197
EPA_MW28	400066.2	3755133.6	120.4	119.91	85	105	110	112	8	4	SCH80 PVC	0.02	SCH80 PVC	3	80	112	Sonic	95/5 slurry medium chips	1 74	74 80
EPA_MW29	400888.8	3753618.9	107.34	107.1	90	110	115	117	8	4	SCH80 PVC	0.02	SCH80 PVC	3	87	117	Sonic	95/5 slurry medium chips	1 80	80 87

Table 3 - Well Construction Summary
Omega Superfund Site
Operable Unit 2

Well ID	X Coordinate (meters)	Y Coordinate (meters)	Surface Elevation (feet amsl)	TOC Elevations[a] (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Total Depth (feet bgs)	Total Depth Drilled (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Screen Material	Screen Slot Size (inches)	Casing Material	Filter Pack Grade	Filter Pack Top (feet bgs)	Filter Pack Bottom (feet bgs)	Drilling Method	Annual Seal Material	Annular Seal Top (feet bgs)	Annular Seal Bottom (feet bgs)
EPA_MW30	401820.2	3753277.4	107.24	106.7	95	115	120	130	8	4	SCH80 PVC	0.02	SCH80 PVC	3	91	120	Sonic	95/5 slurry medium chips medium chips (backfill)	1 85 120	85 91 130
EPA_MW31	403391.2	3759680.3	233	232.67	106	121	126	126	8	2	SCH80 PVC	0.01	SCH80 PVC	2/16	103	126	Hollow-stem auger	95/5 slurry bentonite chips #60 transition sand	1 99.5 102.6	99.5 102.6 103
EPA_MW32[a]	400218.1	3754800.2	117.08	116.78	163	178	183	250	8	3	SCH80 PVC	0.02	SCH80 PVC	3	160	183	Sonic	95/5 slurry bentonite chips #30 transition sand #3 sand bentonite chips #30 transition sand	1 70 75.5 77 102 158	70 75.5 77 102 158 160
Wells installed by the WRD																				
Hawkins 1a1	400942.8	3756513.9	147.83	147.4	480	490	490	518	7.875	2	SST	0.01	SCH80 PVC	2/12	473	495	Mud rotary	cement grout bentonite pellets	2 462	462 473
Hawkins 1b2	400939.4	3756514.0	147.82	147.3	378	388	388	392	7.875	2	SST	0.01	SCH80 PVC	2/12	373	400	Mud rotary	cement grout bentonite pellets	2 362	362 373
Hawkins 1c3	400936.0	3756513.9	147.75	147.19	286	296	296	300	11.5	2	SST	0.01	SCH80 PVC	2/12	280.5	298.5	Mud rotary	cement grout bentonite pellets transition sand bentonite pellets cement grout bentonite pellets transition sand bentonite pellets	2 155 165 179.5 201 225 235 257.5	155 165 179.5 201 225 235 257.5 280.5
Hawkins 1c4	400936.1	3756514.0	147.75	147.18	242	252	252	300	11.5	2	SST	0.01	SCH80 PVC	2/12	235	257.5	Mud rotary	cement grout bentonite pellets transition sand bentonite pellets cement grout bentonite pellets	2 155 165 179.5 201 225	155 165 179.5 201 225 235
Hawkins 1c5	400936.0	3756514.0	147.75	147.2	168	178	178	300	11.5	2	SST	0.01	SCH80 PVC	2/12	165	179.5	Mud rotary	cement grout bentonite pellets	2 155	155 165
Koontz 1a1	400729.3	3755367.4	135.17	134.71	481	491	491	518	7.875	2	SST	0.01	SCH80 PVC	2/12	474	513	Mud rotary	cement grout bentonite pellets	2 463	463 474
Koontz 1b2	400731.0	3755370.4	135.15	134.51	375	385	385	400	7.875	2	SST	0.01	SCH80 PVC	2/12	368.5	390	Mud rotary	cement grout bentonite pellets	2 357	357 368.5
Koontz 1c3	400732.6	3755372.8	135.14	134.8	282	292	292	303	11.5	2	SST	0.01	SCH80 PVC	2/12	276.5	293	Mud rotary	cement grout bentonite pellets transition sand bentonite pellets cement grout bentonite pellets transition sand bentonite pellets cement grout bentonite pellets	2 133 144 164.5 176 207.5 218 234.5 250 267	133 144 164.5 176 207.5 218 234.5 250 267 276.5

Table 3 - Well Construction Summary
Omega Superfund Site
Operable Unit 2

Well ID	X Coordinate (meters)	Y Coordinate (meters)	Surface Elevation (feet amsl)	TOC Elevations[a] (feet amsl)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Total Depth (feet bgs)	Total Depth Drilled (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Screen Material	Screen Slot Size (inches)	Casing Material	Filter Pack Grade	Filter Pack Top (feet bgs)	Filter Pack Bottom (feet bgs)	Drilling Method	Annual Seal Material	Annular Seal Top (feet bgs)	Annular Seal Bottom (feet bgs)
Koontz 1c4	400732.6	3755372.9	135.14	134.76	223	233	233	303	11.5	2	SST	0.01	SCH80 PVC	2/12	218	234.5	Mud rotary	cement grout bentonite pellets transition sand bentonite pellets cement grout bentonite pellets	2 133 144 164.5 176 207.5	133 144 164.5 176 207.5 218
Koontz 1c5	400732.7	3755372.8	135.14	134.76	150	160	160	303	11.5	2	SST	0.01	SCH80 PVC	2/12	144	164.5	Mud rotary	cement grout bentonite pellets	2 133	133 144
Wells to be installed as part of the LEI[b]																				
LEI Well Cluster Location 1	To Be Determined																			
LEI Well Cluster Location 2																				
LEI Well Cluster Location 3																				
Wells to be installed as part of the PDI[c]																				
To Be Determined																				

Notes:

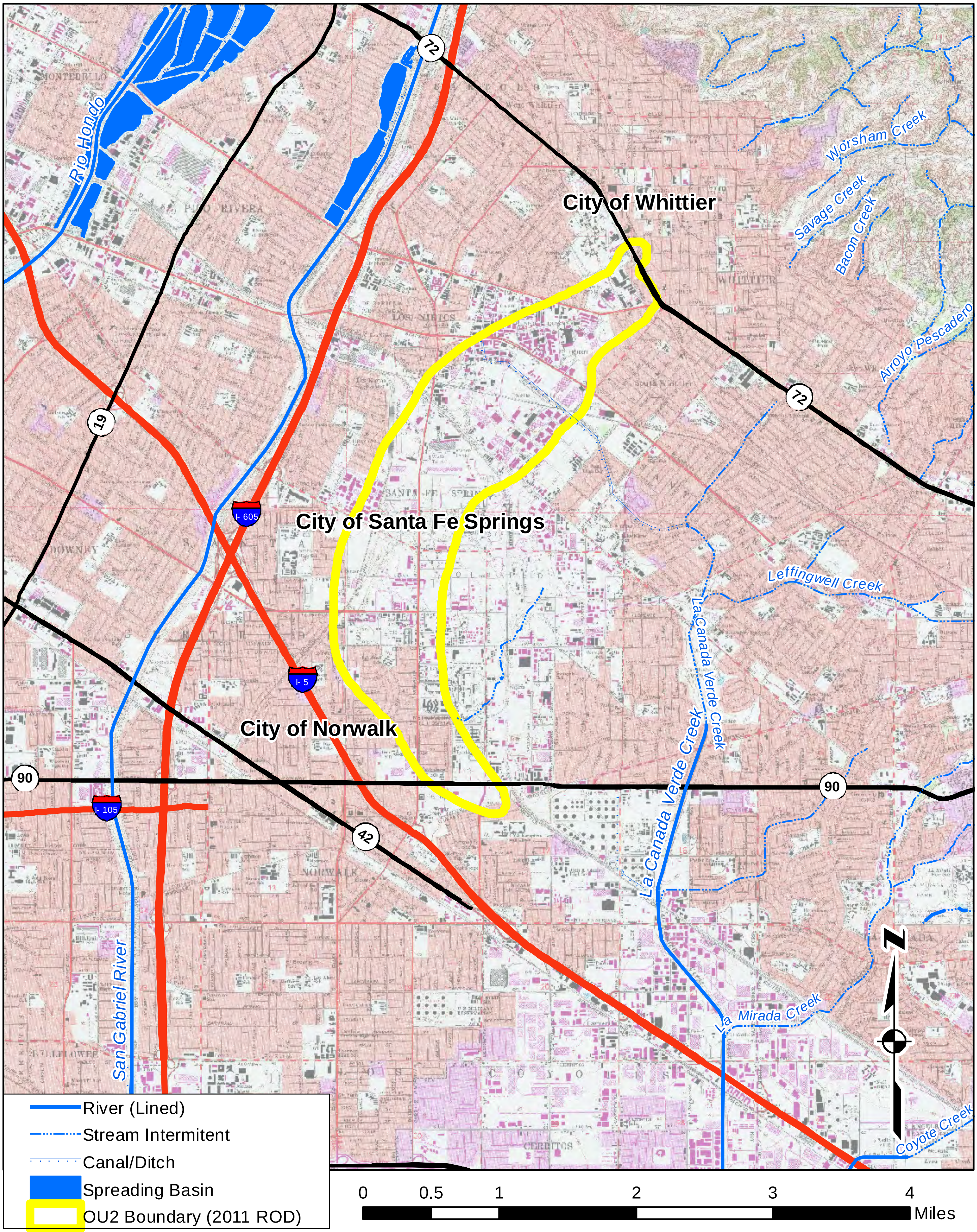
X and Y coordinates surveyed in UTM meters, NAD 83, Zone 11
Surface and TOC elevations surveyed in NAVD 88 datum, benchmark of DYHS (Downey High School).

a - MW32 is constructed with a 1-inch piezometer screened from 80 to 100 feet bgs in the filter pack.
b - The construction details of these wells will be determined during well installation activities and presented in the LEI Report (Geosyntec, 2016).
c - The final location and construction details for these wells will be determined during well installation activities and presented in the PDI Report (H+A, 2016).

Sources:
1. CH2M Hill, 2015. Groundwater Monitoring Report for 2012, 2013, and 2014, Omega Chemical Corporation Superfund Site. August.
2. Ardent Environmental Group, Inc., 2014. Groundwater Monitoring Well Installation Report - Hawkins Wells, Central Basin Groundwater Contamination Study. 16 December.
3. Ardent Environmental Group, Inc., 2014. Groundwater Monitoring Well Installation Report - Koontz Wells, Central Basin Groundwater Contamination Study. 16 December.

amsl - above mean sea level
bgs - below ground surface
LEI - Leading Edge Investigation
n/a - not available
NAD 83 - North American Datum 1983
NAVD 88 - North American Vertical Datum 1988
NGVD 29 - National Geodetic Vertical Datum 1929
OU2 - Operable Unit 2
PDI - Pre-Design Investigation
PVC - polyvinyl chloride
SCH - schedule
SST - stainless steel
TOC - top of casing
UTM - Universal Transverse Mercator
WRD - Water Replenishment District of Southern California

FIGURES



Document Name: 1217 CWP Fig01 SiteLocation F00 Date Exported: 8/15/2016

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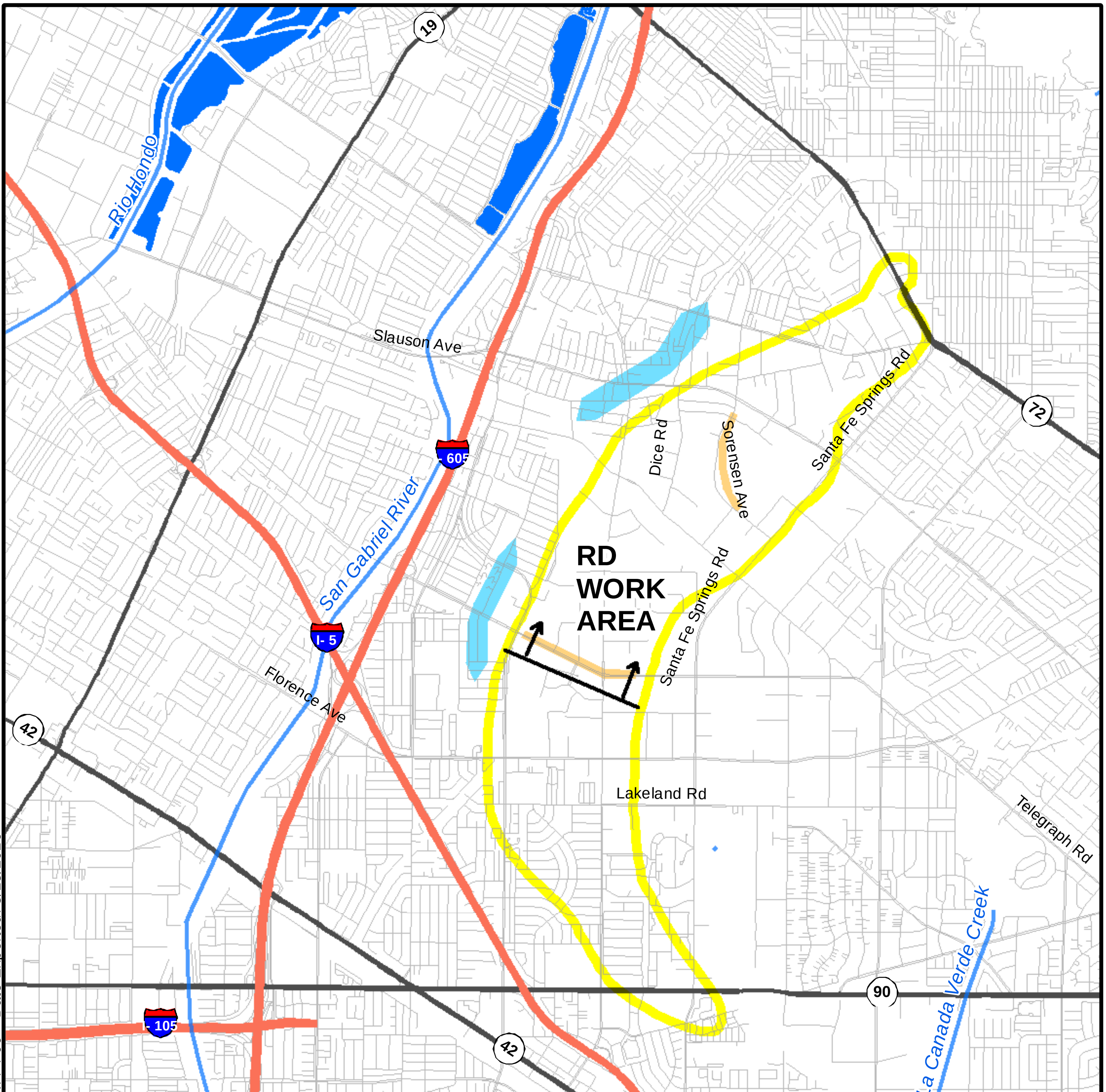
FIGURE 1. SITE LOCATION



- Spreading Basin
- OU2 Boundary (2011 ROD)
- River (Lined)
- Remedial Design Work Area
- Potential Reinjection Areas
- Potential Locations of NE/CE Area Extraction Wells

NOTES:

Remedial Design Work Area (RDWA) includes Northern Extraction (NE) and Central Extraction (CE) areas. Also includes the following end uses for treated groundwater:

1) Shallow reinjection (illustrated above as potential reinjection areas)
2) Spreading basin recharge (illustrated above as spreading basin)
3) Reclaimed use (non-potable, not illustrated)
4) Deep reinjection (not illustrated)

0 0.25 0.5 1 1.5 2 Miles

N

Document Name: 1217 CWP Fig02 RDWA F00 Date Exported: 8/15/2016

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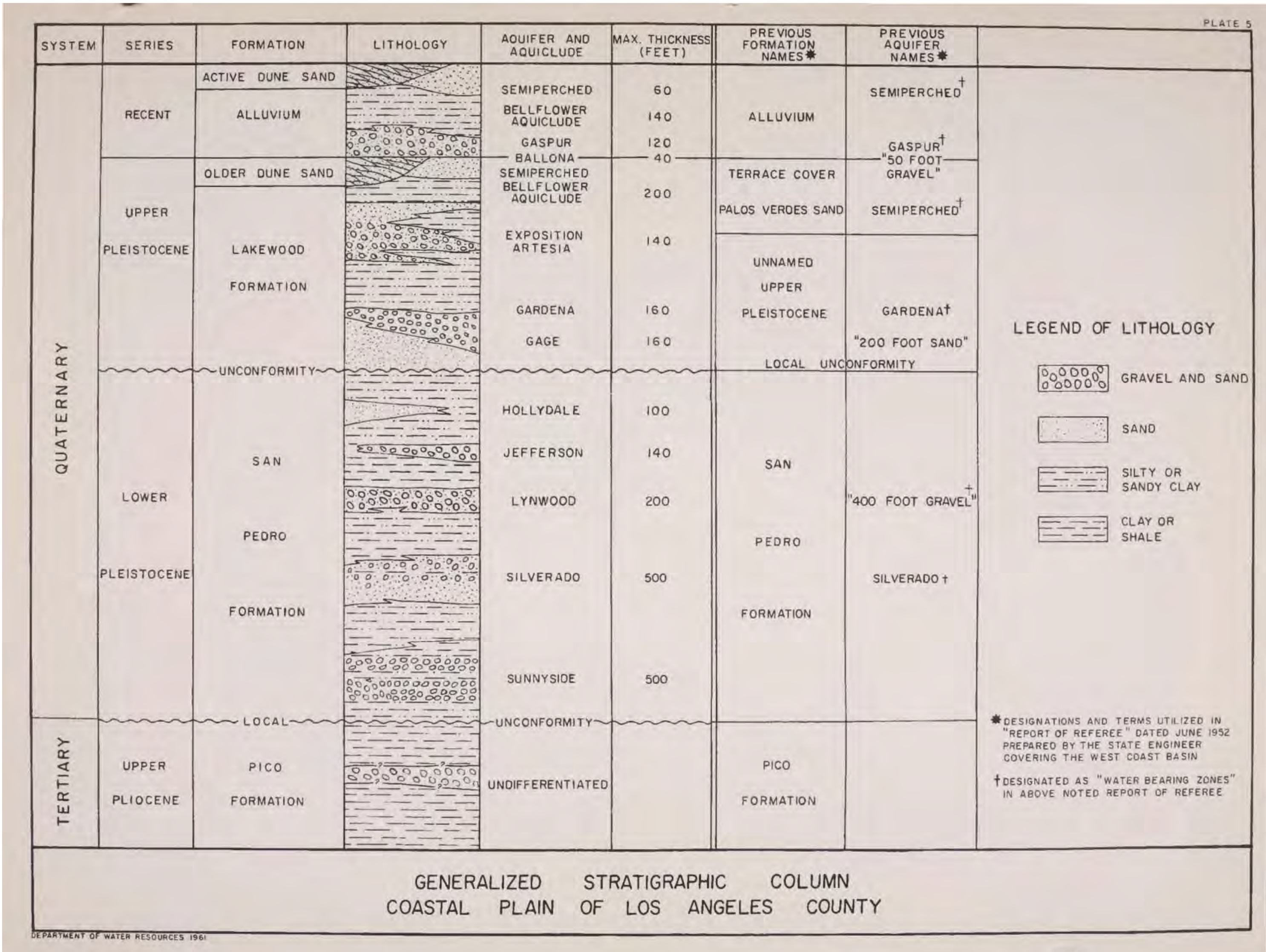
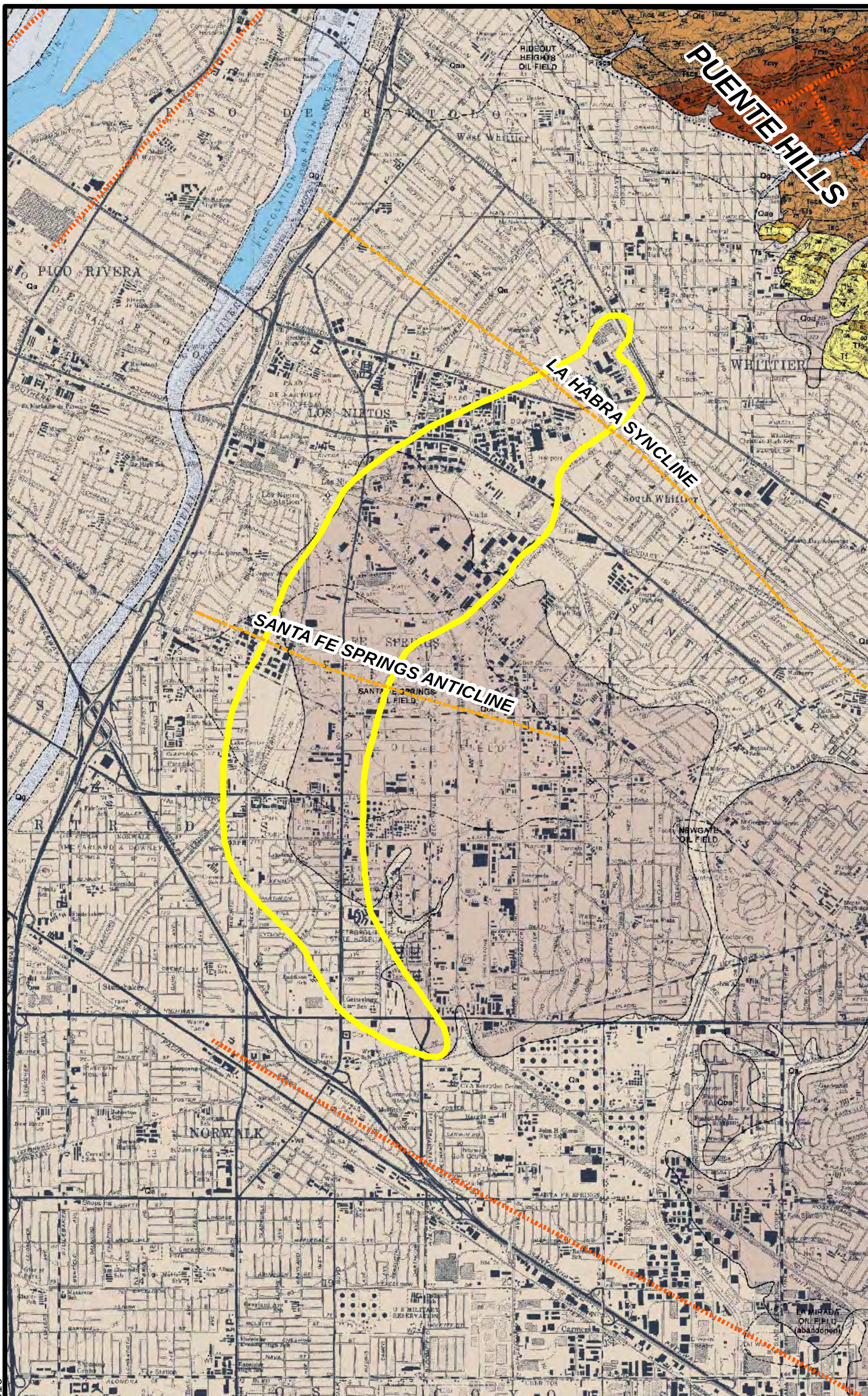
FIGURE 2. REMEDIAL DESIGN WORK AREA



Reprinted from California Department of Water Resources Bulletin 104, 1961, Plate 5.

FIGURE 3. GENERALIZED STRATIGRAPHIC COLUMN, COASTAL PLAIN OF LOS ANGELES COUNTY



LEGEND

af
Qg
Qa

SURFICAL SEDIMENTS
Unidissected Alluvial Deposits

Qls

LANDSLIDE DEBRIS

Qae
Qoa

OLDER SURFICAL SEDIMENTS
Elevated and dissected alluvial deposits

— UNCONFORMITY —

Qlhc
Qlh

LA HABRA FORMATION

— LOCAL UNCONFORMITY —

Qsp

SAN PEDRO FORMATION

Tfs
Tf Tfr

FERNANDO FORMATION

Tsc Tscs Tscg

SYACAMORE CANYON FORMATION

Tmy Tm
Tmss Tms
Tmlv

MONTEREY FORMATION

SOURCES OF INFORMATION:

Geologic Map:

Geologic Map of The Whittier & La Habra Quadrangles (Western Puente Hills) Los Angeles and Orange Counties, California

By Thomas W. Dibblee, Jr., 2001

Dibblee Geology Center Map # DF-74, Second Printing 2010

Other:

Folds (CH2MHill, 2010 RI Report)
Faults (from USGS)

GEOLOGIC SYMBOLS

not all symbols shown on each map

FORMATION CONTACT
dashed where inferred or indefinite
dotted where concealed

MEMBER CONTACT
between units of a formation
Prominent bed

CONTACT BETWEEN SURFICIAL SEDIMENTS
located only approximately in places

FAULT: *Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parrallel arrows indicated inferred relative lateral movement. Relative vertical movement is shown by U/D (U=Upthrown site, D=downthrown site). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.*

U
D
25
?

Strike and dip of sedimentary rocks

18 *inclined*
20 *inclined (approximate)*
80 *overturned*
horizontal
vertical

OTHER SYMBOLS:

Direction of landslide movement
outline of water bodies shown on map
water well
oil well
springs

OU2 Boundary (2011 ROD)

N

0 0.25 0.5 1 1.5 2
Miles

Document Name: 1217_CWP_Fig10_Geology_F00 Date Exported: 8/15/2016

HARGIS + ASSOCIATES, INC.
Hydrogeology/Engineering

FIGURE 4. MAIN GEOLOGIC FEATURES

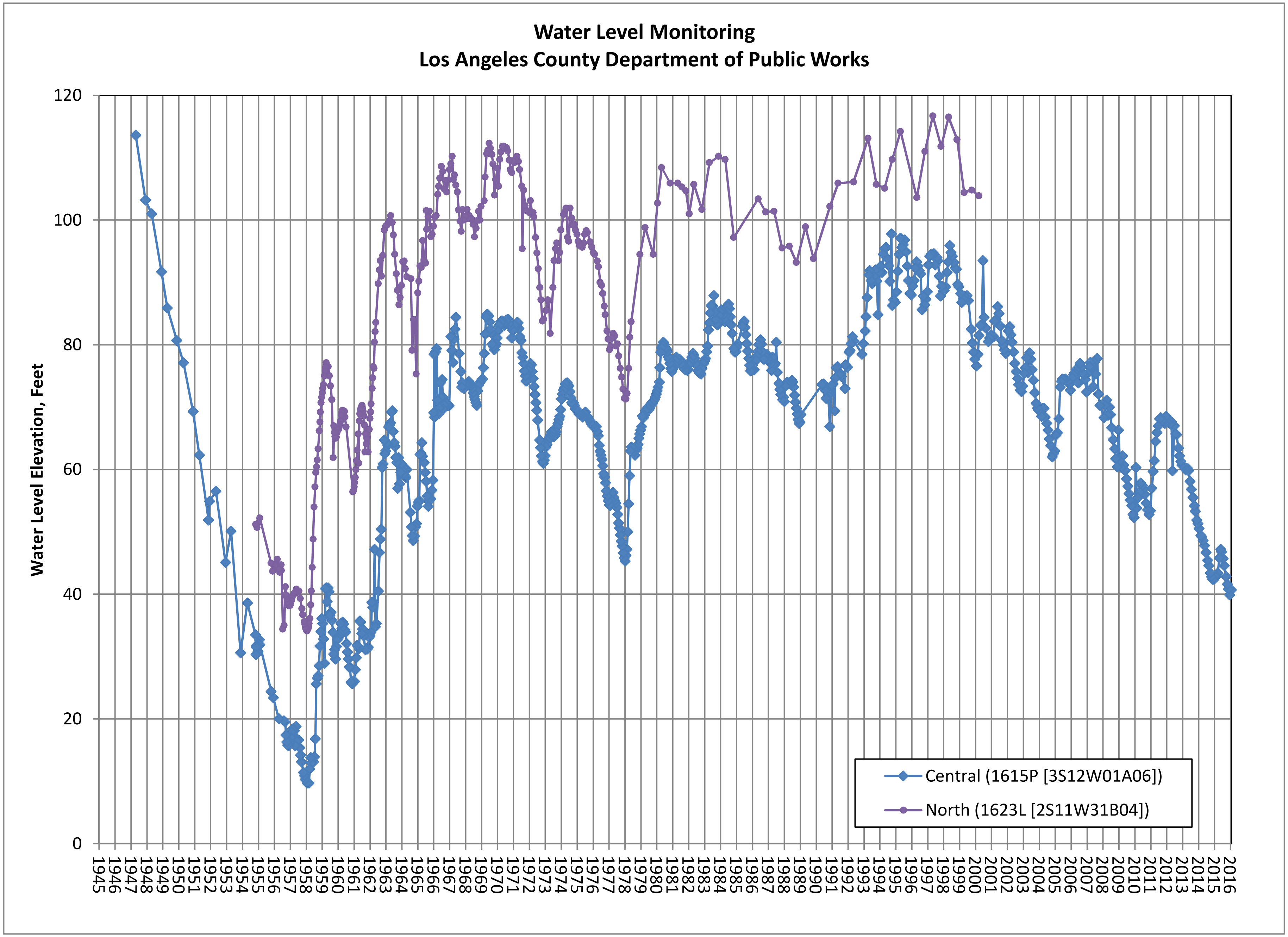
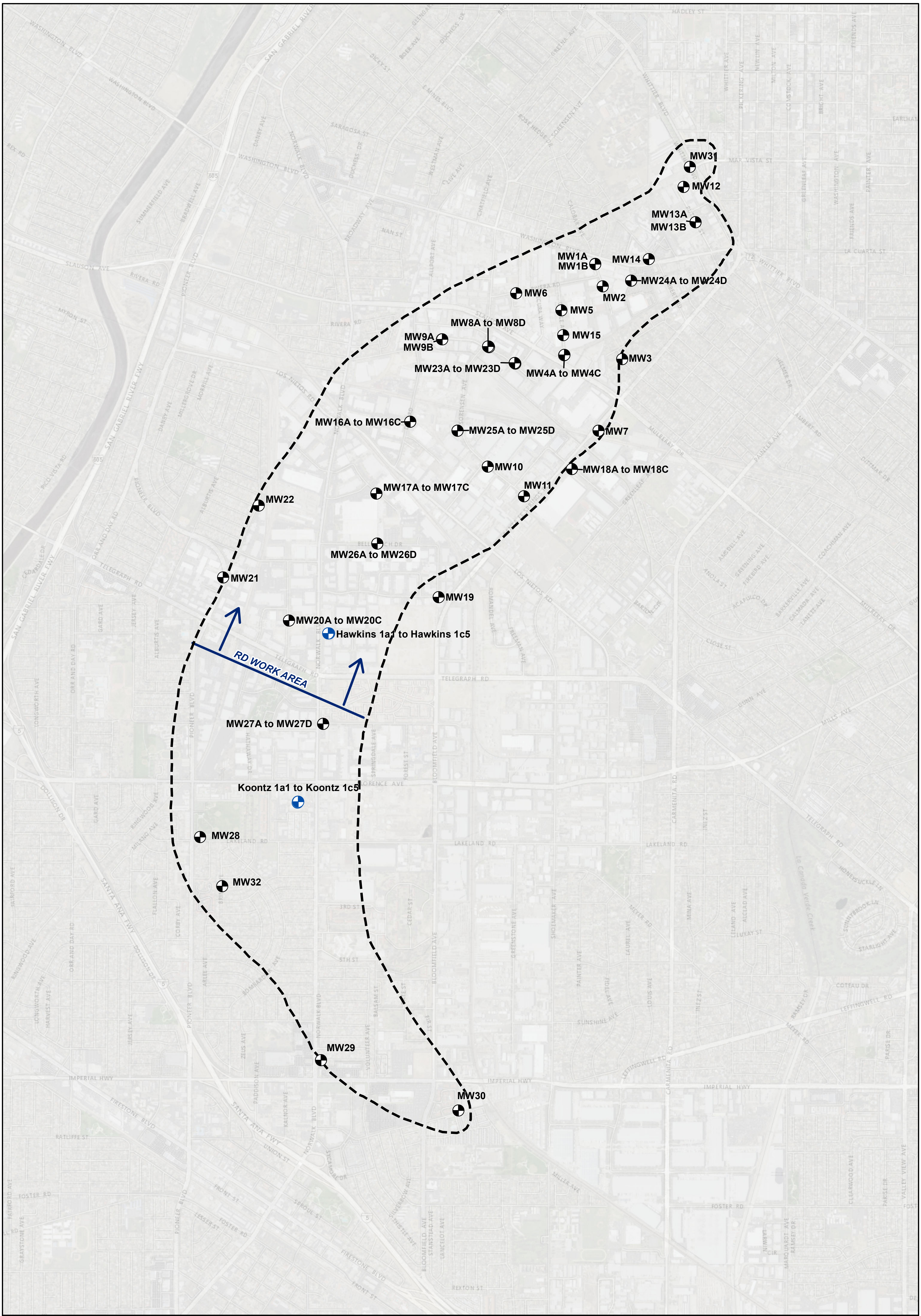


FIGURE 5. HISTORICAL GROUNDWATER HYDROGRAPHS



Legend

Monitoring Wells
- Installed by EPA
- Installed by WRD

OU2 Boundary (2011 ROD)

Remedial Design Work Area (includes Northern Extraction and Central Extraction areas)

Notes:
Wells co-located in groups of three or more have been labelled as a group (eg; MW26A to MW26D).
Wells installed during the Leading Edge Investigation and Pre-Design Investigation will be added to the monitoring network upon submittal of their respective reports.
WRD = Water Replenishment District
OU2 = Operable Unit 2
ROD = Record of Decision

Work Area Monitoring Network

Omega Superfund Site - OU2
Los Angeles County, California

Geosyntec consultants

WR2209 | November 2016

Figure 6

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APPENDIX A

Quality Assurance Project Plan

APPENDIX B

Field Sampling Plan

APPENDIX C

Health and Safety Plan

APPENDIX D

Responses to EPA Comments